CHAPTER 82 EVALUATE FAR PART 121 EXTENDED-RANGE OPERATIONS WITH TWO-ENGINE AIRCRAFT (ETOPS)

Section 1 Background

1. PTRS ACTIVITY CODES

A. *Maintenance:* 3319

B. *Avionics:* 5319

3. OBJECTIVE. This chapter describes the process of evaluating a FAR Part 121 operator for a deviation under FAR § 121.161(a) for extended-range operations with two-engine airplanes.

5. GENERAL

A. *Definition:*

- *Extended-Range Operation With Two-Engine Airplanes (ETOPS):* Operations conducted over a route containing a point further than one hour flying time at the normal one-engine inoperative cruise speed (in still air) from an adequate airport

B. *An ETOPS authorization requires an approval from the Director, Flight Standards Service, for a deviation to the operating rule of FAR § 121.161. To meet the requirements of this deviation the operator must be able to:*

(1) Substantiate that the type design reliability and the performance of the proposed airplane/engine combination have been evaluated per the guidance in Advisory Circular 120-42, Extended-Range Operation With Two-Engine Airplanes, as amended, and found suitable for extended range operations

(2) Submit an application package that includes supplemental maintenance requirements and programs that allow for safe operations under an ETOPS authorization.

C. *Application Package.* The application package must include the following programs:

(1) *Supplemental maintenance program.* This program must include the basic maintenance program with additional ETOPS requirements for the airplane being considered. These requirements should include maintenance procedures that prevent actions such as changing oil filters, chip detectors, fuel controls, etc., from being done simultaneously on both engines.

(2) *Verification program.* This program must have procedures that would preclude an airplane from being dispatched for extended range operation unless appropriate corrective action has been taken and verified, after any of the following situations:

- A propulsion system shutdown
- A primary system failure
- Any significant adverse trends/repeat problems from a previous flight

(3) *Airframe/Engine condition monitoring program.* Condition monitoring should provide a system for data collection that ensures the timely analysis and correction of engine problems. This program should accomplish the following:

- Prevent in-flight shutdowns of powerplant systems through detection of early stage deterioration
- Ensure that engine limit margins are maintained so that a prolonged single-engine diversion may be conducted without exceeding approved engine limits (i.e., rotor speeds, exhaust gas temperature, etc.) at all approved power levels and expected environmental conditions

(4) *Reliability program.* This must be an event-oriented reliability program designed primarily to identify and prevent problems. This program must incorporate reporting criteria for use by the carrier and the FAA as a measure of extended range reliability. The ETOPS reliability program can be a supplement to an existing reliability program if the existing program is event-oriented.

(5) *Engine/APU oil consumption monitoring program.* This program must monitor oil consumption on a flight-by-flight basis. This monitoring must take into account the amount of oil added at the departing ETOPS stations with a reference to the running average consumption. Additionally, prior to each extended range leg, the program must verify the oil system integrity.

(6) *Extended range parts control program.* This program should ensure that distinct ETOPS parts, as required by type design criteria, are utilized to maintain the integrity of the systems that are unique to ETOPS. This program must consider verification of parts placed on aircraft through parts borrowing and pooling agreements. For further information see Vol. 2, Ch. 87, Approve Parts/ Parts Pool/Parts Borrowing.

(7) *Maintenance training program.* The training program should focus on extended range awareness for all personnel involved in the extended range maintenance program. It may be included in the normal maintenance training but should emphasize the special nature of extended range maintenance requirements.

(8) *Continuing analysis and surveillance program.* The air carrier's normal continuing analysis and surveillance program should be supplemented to require regular surveillance of the extended range program. This supplemented program must ensure the continued integrity of the ETOPS maintenance programs while allowing for program adjustment, as required.

Section 2 Procedures

1. PREREQUISITES AND COORDINATION REQUIREMENTS

A. *Prerequisites*

- Knowledge of the regulatory requirements of FAR Parts 121
- Knowledge of Advisory Circular 120-42, Extended-Range Operation With Two-Engine Airplanes, as amended
- Successful completion of the Air Carrier Airworthiness Inspectors Indoctrination String Course
- Successful completion of the Aircraft Maintenance Reliability Program Course, as available
- Successful completion of the Aircraft Systems Training Course, as available

B. *Coordination*

(1) This task requires coordination between maintenance inspectors, avionics inspectors, Regional offices, AFS-400 and AFS-300, as required.

(2) For questions regarding an ETOPS authorization, contact the following, as required:

- AFS-330, Maintenance Division
- Aircraft Evaluation Group (AEG)
- Aircraft/Engine Certification Directorate

3. REFERENCES, FORMS, AND JOB AIDS

A. *References*

- Operator's manuals
- Operations Specification

B. *Forms*

- FAA Form 8400.8, Operations Specifications

C. *Job Aids.* None.

5. PROCEDURES

A. *Verify the Compliance of the Aircraft With the Configuration, Maintenance, and Procedures Document.* Verify compliance through coordination with the Aircraft Maintenance Division and the Aircraft Evaluation Group.

B. *Evaluate the Operator's Current Maintenance Program.* Request and evaluate the following information for ETOPS suitability:

(1) The date of type design and the review of each engine/airframe combination

(2) The in-service experience for each engine/airframe combination, to include the following:

(a) The number of months/years of operational experience with each specific engine/airframe combination

(b) The total number of ETOPS and/or domestic operations conducted with the specific engine/airframe

(c) The engine/airframe hours and cycles, to include both total and high time engines

(d) The in-flight shutdown rate (all causes), including the 12-month and 6-month rolling average for both the ETOPS and the world fleet

(e) The unscheduled engine removal rate for both the world fleet and the operator

(f) The mean time between failure (MTBF) for major components

(g) The record of APU start and run reliability

(h) The records of delays and cancellations, with the causes, by the specific aircraft systems

(i) The records of significant operator events, including the phase of flight where the event occurred, such as:

- Uncommanded power changes (surge or rollback)
- Inability to control engine or obtain desired power
- In-flight shutdown events

C. *Review the Operator's Manual.* The inspector must ensure that the following programs and procedures have been included as part of the operator's supplemental maintenance program:

(1) Verification program, to include:

- A list of primary systems
- Conditions that require verification flights
- Procedures for initiating verification actions
- Procedures that monitor and evaluate corrective actions
- Procedures that verify the implementation of corrective action
- Procedures that preclude repeat items from occurring
- Procedures that identify and reverse the adverse trends

(2) Engine condition monitoring program, to include:

- Scope of program, e.g., data collection and analysis
- Notification procedures for deterioration
- Deterioration monitoring limits for internal engine parts

(3) Reliability program, to include:

- Reporting criteria
- Procedures to ensure reporting of significant individual events (engine shutdowns, flight diversions, etc.)

(4) Engine/APU oil consumption monitoring program, to include:

- Established limits of consumption
- Procedures for use and verification prior to the start of each extended range leg

(5) Extended range parts control, to include:

- Methods of verification of proper parts
- Control procedures during parts pooling and borrowing

(6) Maintenance training program, to ensure:

- Personnel are aware that an ETOPS authorization is in place

- Personnel, including contract personnel, are adequately trained on the special programs required by an ETOPS authorization

(7) Continuing analysis and surveillance program, to include:

- Ensuring the continued integrity of the ETOPS maintenance programs
- Ensuring that adjustments are made, as required, to the ETOPS programs

(8) Procedures that accomplish the following:

- Preclude simultaneous actions from being applied to multiple similar elements in any ETOPS-critical system
- Identify ETOPS-related tasks on routine work forms and related instructions
- Develop an ETOPS over-water service check to verify the status of the airplane and ensures certain critical items are acceptable

D. *Analyze Results*

(1) If problems are found, return material to operator.

(2) If the submitted material is acceptable, forward the material to the Region for submittal. The Region will forward the material to AFS-300 for concurrence and to AFS-1 for final deviation approval.

7. TASK OUTCOMES

A. *File PTRS Transmittal Form*

B. Successful completion of this task will result in the following*:*

- An Extended-Range Operation With Two-Engine Airplanes Authorization
- Amendment to the Operations Specifications paragraphs D86 and D86-1
- Notification sent to AEU of the deviation. The notification must include the operator's locations of dispatch.

C. *Document Task.* File all supporting paperwork in the operator's office file.

9. FUTURE ACTIVITIES. Normal surveillance.